SERV. 52240

GM-120 U,C,E

COMPONENT CAR STEREO
HIGH POWER MAIN AMPLIFIER

Original

SERVICE MANUAL

SPECIFICATIONS

Power source	DC 13.8V (11～16V allowable)
Grounding system	Negative type
Dimensions (W × H × D)	180 × 60 × 212 mm
	(7-1/8 × 2-3/8 × 8-3/8 in.)
Weight	2.3 kg (5.1 lbs.)
Max. current consumption	10A
Power output (max.)	60W + 60W
(continuous)	35W + 35W (1 kHz, 1%)
	30W + 30W (30 Hz～20 kHz, 0.3%)
Load impedance	4Ω (4～8Ω allowable)
Frequency response	30～30,000 Hz (−3 dB)
Signal-to-noise ratio	More than 75 dB
Distortion	No more than 0.04% (at 25W, 1 kHz)
Input level	70 mV/22 kΩ

Note:
Specifications and the design subject to possible modification without notice due to improvements.

PIONEER®

CONTENTS

1. PARTS LOCATION 1
2. CIRCUIT DESCRIPTION
   - 2.1 Block Diagram 1
   - 2.2 Power Supply Circuit 2
   - 2.3 Power Amplifier 2
   - 2.4 Protection Circuit 3
3. ADJUSTMENT
   - 3.1 Idle Current Adjustment 4
4. SCHEMATIC CIRCUIT DIAGRAM 5
5. CONNECTION DIAGRAM 7
6. EXPLODED VIEW 9
7. PACKING METHOD 10
8. PARTS LIST 11

1. PARTS LOCATION

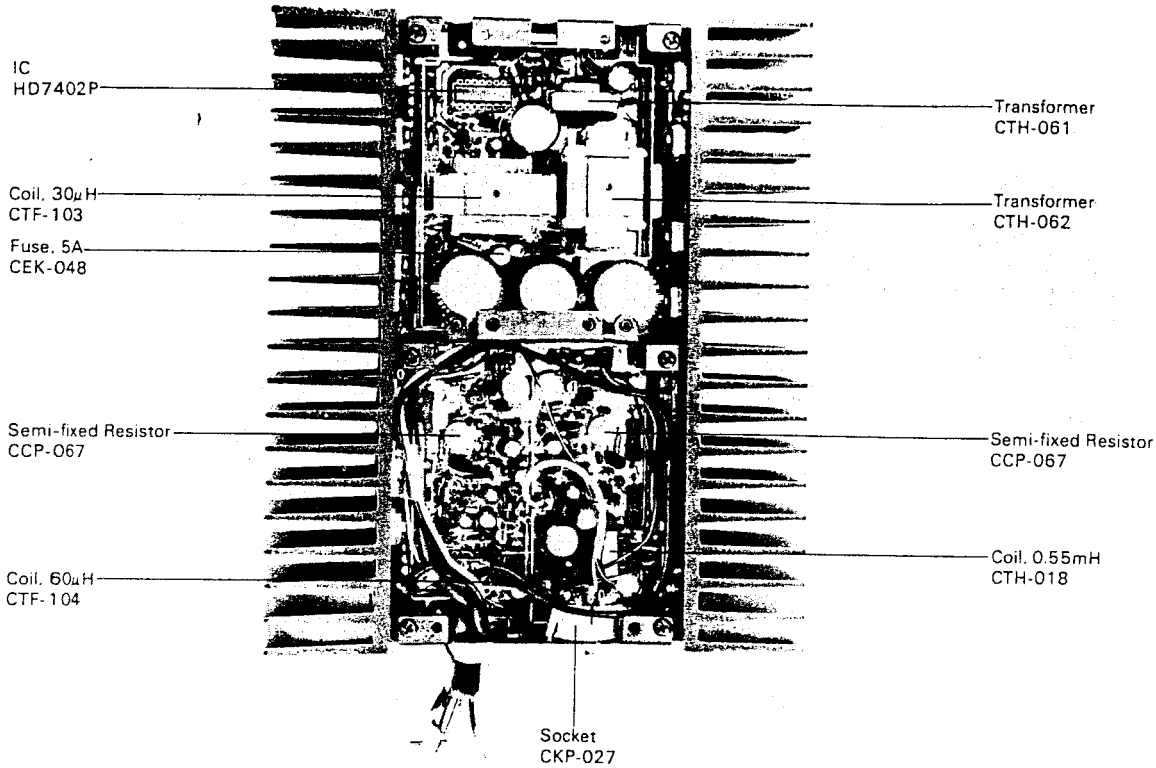


Fig. 1

2. CIRCUIT DESCRIPTION

2.1 BLOCK DIAGRAM

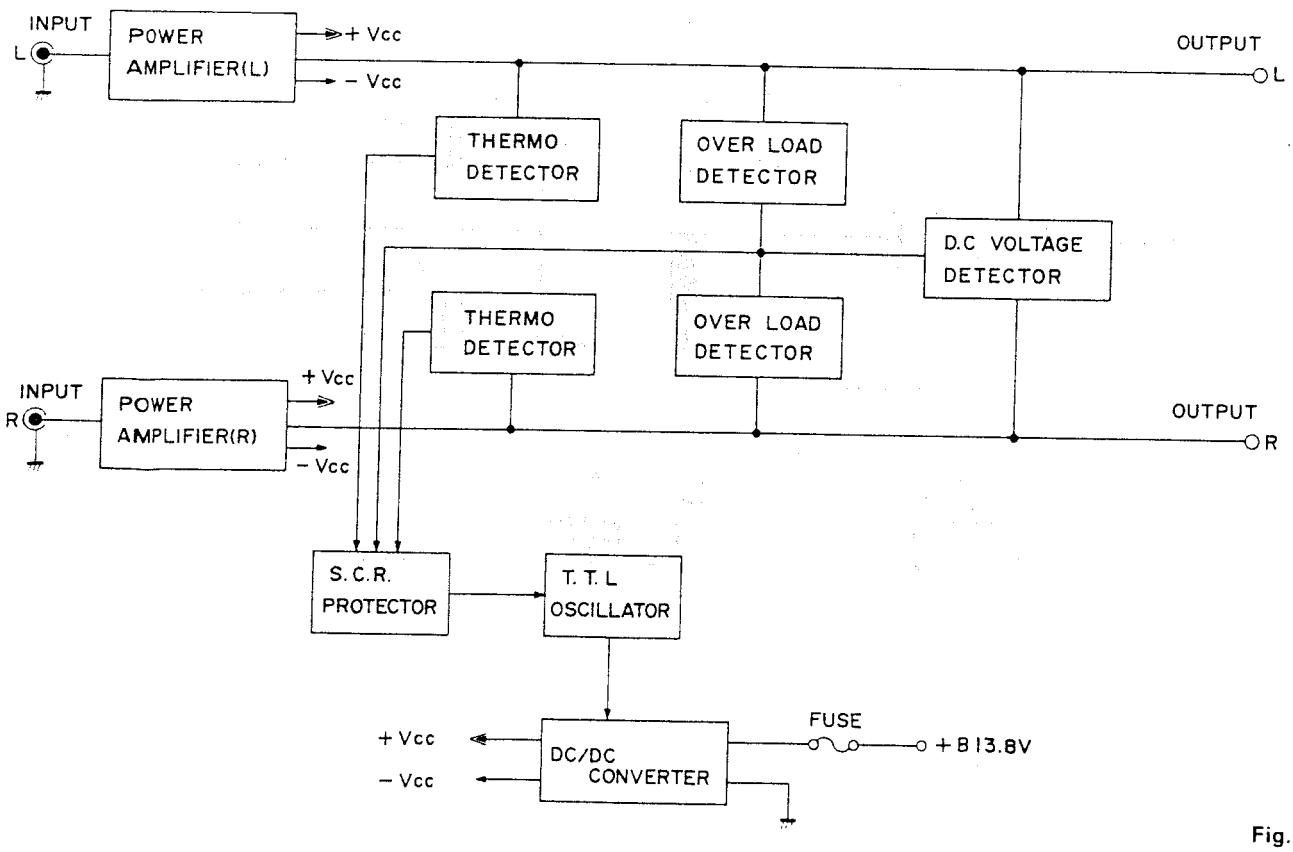


Fig. 2

2.2 POWER SUPPLY CIRCUIT

- The high-efficiency DC-DC converter boosts a DC voltage of 13.8V to ±24V (at no load) to obtain high power. The circuit is completely of a separately excited system, and its oscillation frequency is set outside of the audible zone (approximately 29 kHz) for improving the power rise characteristics and switching waveforms. The power to the power stage is supplied by bridge rectifying by an RF rectifier silicon diode, and two large-capacitance capacitors (3,300 μF each).
  Pioneer's exclusive DC feedback circuit used for improved power regulation assures stabilized output voltage at all times.
- A special booster circuit is provided for the memory circuit of your deck or tuner so that the deck or tuner will not be adversely affected at all by voltage drops.
- The power amplifier is automatically switched on and off by a built-in electronic switch synchronously with your deck or tuner.
  When the deck or tuner is switched on, Q38 is equivalently grounded, and switched on, thereby supplying the power to the T.T.L. oscillator to operate it. (Fig. 3)

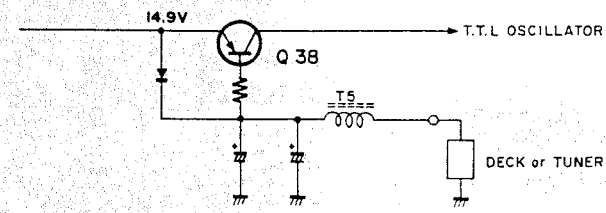


Fig. 3

2.3 POWER AMPLIFIER (FIG. 4)

The first stage is a differential amplifier (Q1), which is a PNP dual transistor with the current mirror circuit (Q3) as its load, and provides stabilized high gains up to the high range. The voltage amplifiers (Q7, Q9) are Darlington-connected, operating with the constant current circuit (Q5) as a load. They are characterized by high-gain amplification with good linearity.
The output stage consists of Darlington-connected dual SEPP circuits of Class B operation, by which high power outputs are produced with high efficiency.

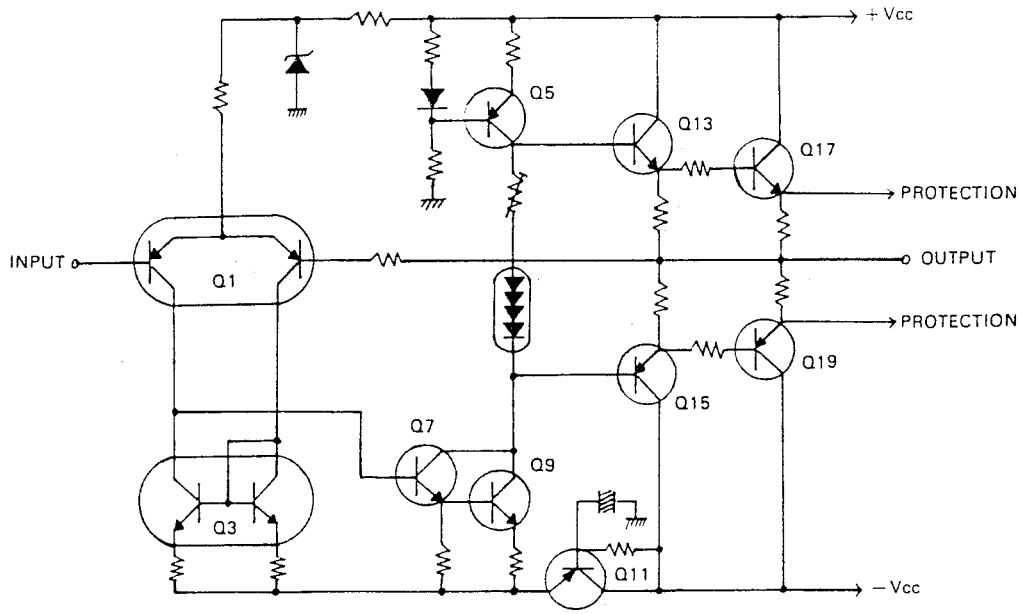


Fig. 4

2.4 PROTECTION CIRCUIT (FIG. 5)

The protection circuit instantly switches off the high-voltage circuits of the set to protect the final stage amplifier and speaker.

The protection circuit consists of the following four parts.

- **Overload Detector Circuit (Q21)**
  This circuit detects output terminal shortcircuits, and unduly small load resistance. It forms a bridge circuit with the load serving as one of its sides, and generates a protection signal if the bridge circuit becomes unbalanced, or if Q21's VBE voltage exceeds 0.6V.
- **DC Voltage Detector Circuit (Q26, Q27)**
  This circuit detects the DC voltage generated at the amplifier output (center) point. The two bases are connected to each other with a capacitor, and one of the terminals is connected to the output center point. AC signals are erased at the same level, and DC voltages only are detected out of balance.

  If the DC balance of the power stage is lost due to some cause, a potential difference develops between the two bases of the differential amplifier so that the collector currents of Q26 and Q27 become unbalanced, thereby energizing either of the two diodes (D19, D20). As a result, a protection signal is generated.
- **Thermo Detector Circuit (TH1)**
  This circuit detects abnormal rise of the heat sink panels. The heat sink panel is fitted with a posistor (TH1), by which a protection signal is generated if the heat sink temperature reaches about 95°C.
- **SCR Protector Circuit (SR1)**
  The above-mentioned protection signals are applied to the SCR (SR1) gate by the diode OR circuit.
  This SCR (SR1) operates to switch off the power applied to the oscillator of the DC-DC converter and thus stops the power supply to the secondary winding of the transformer.

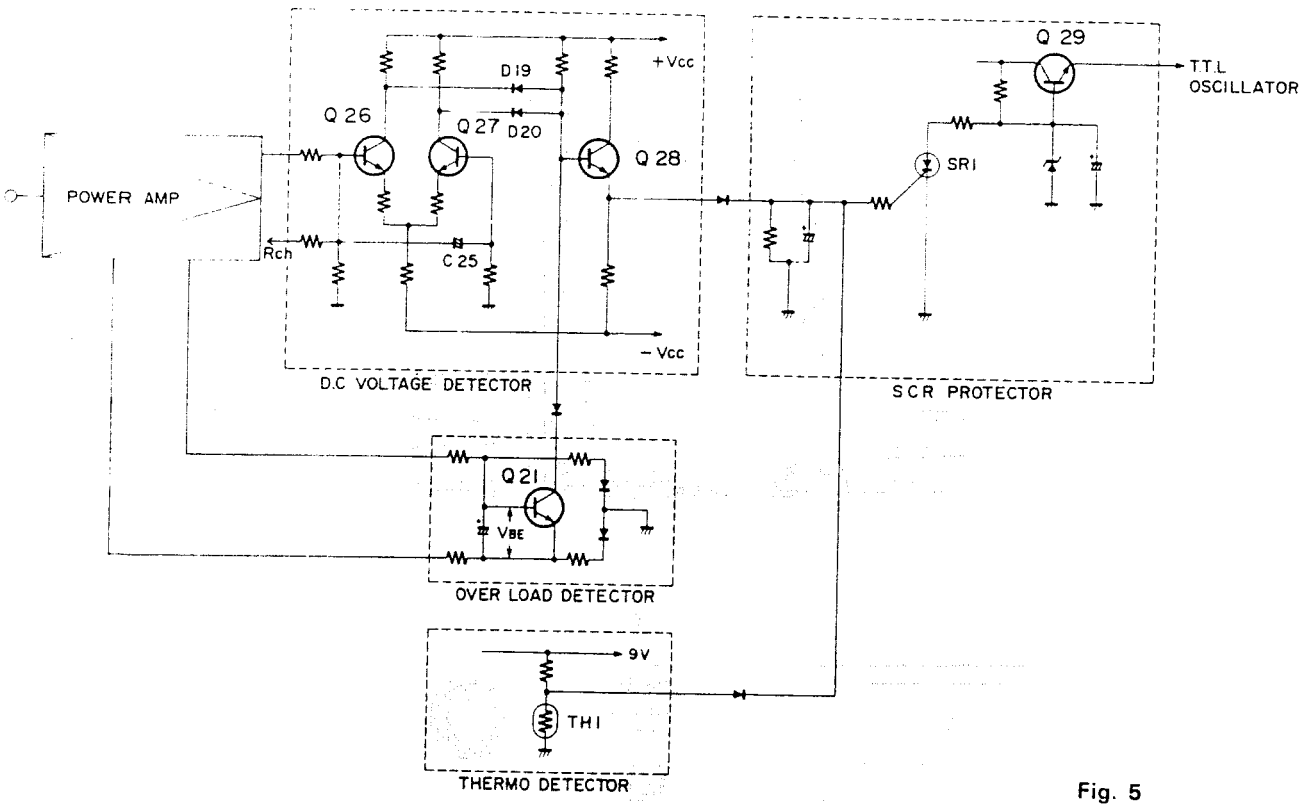


Fig. 5

3. ADJUSTMENT

3.1 IDLE CURRENT ADJUSTMENT

1. Connect your deck or tuner, and turn the volume control to the minimum position.
   If you have neither a deck or tuner, connect a resistor of 200 to 300 ohms (3 to 5W) to Pin 6 of the socket and the ground, and set the power amplifier in operating condition.

Note: No load need be connected.

2. Connect a DC voltmeter (with a range of up to 1.0 mV) to both ends of the emitter resistors (R43, R45 for the left channel; R44, R46 for the right channel) in the power stage.
3. Adjust the semi-fixed resistors (VR1 for the left channel, VR2 for the right channel) until the DC voltmeter reads 13 to 14 mV.
4. After a few minutes of power supply, readjust the semi-fixed resistors (VR1 for the left channel, VR2 for the right channel) until the DC voltmeter reads 13 to 14 mV.

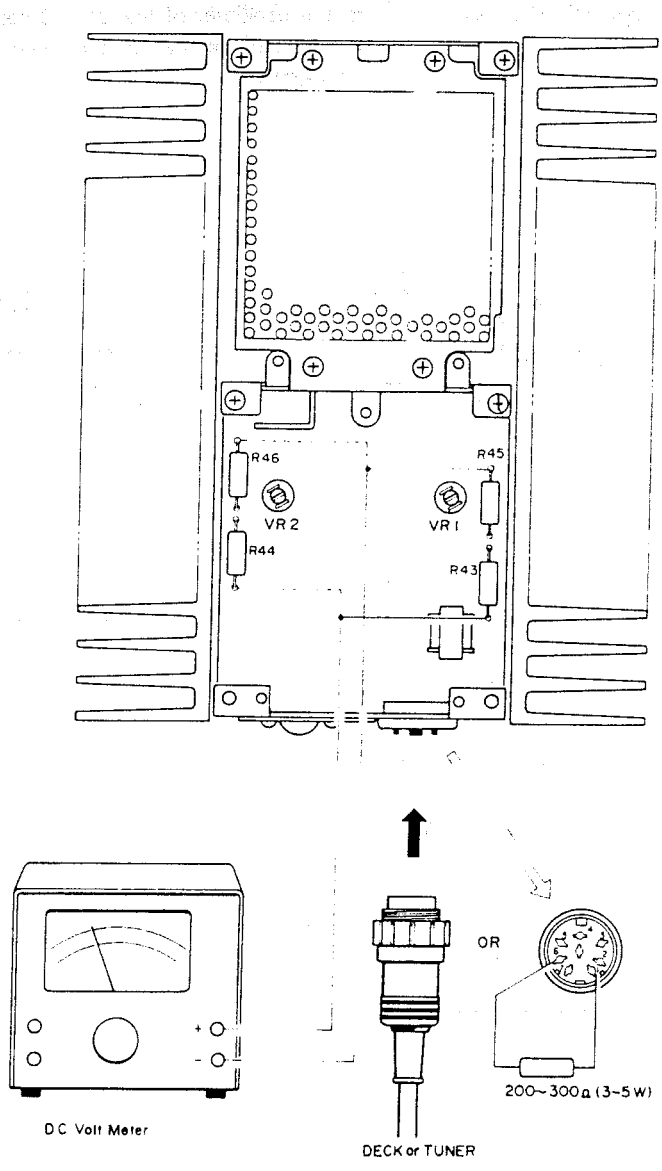


Fig. 6

4. SCHEMATIC CIRCUIT DIAGRAM

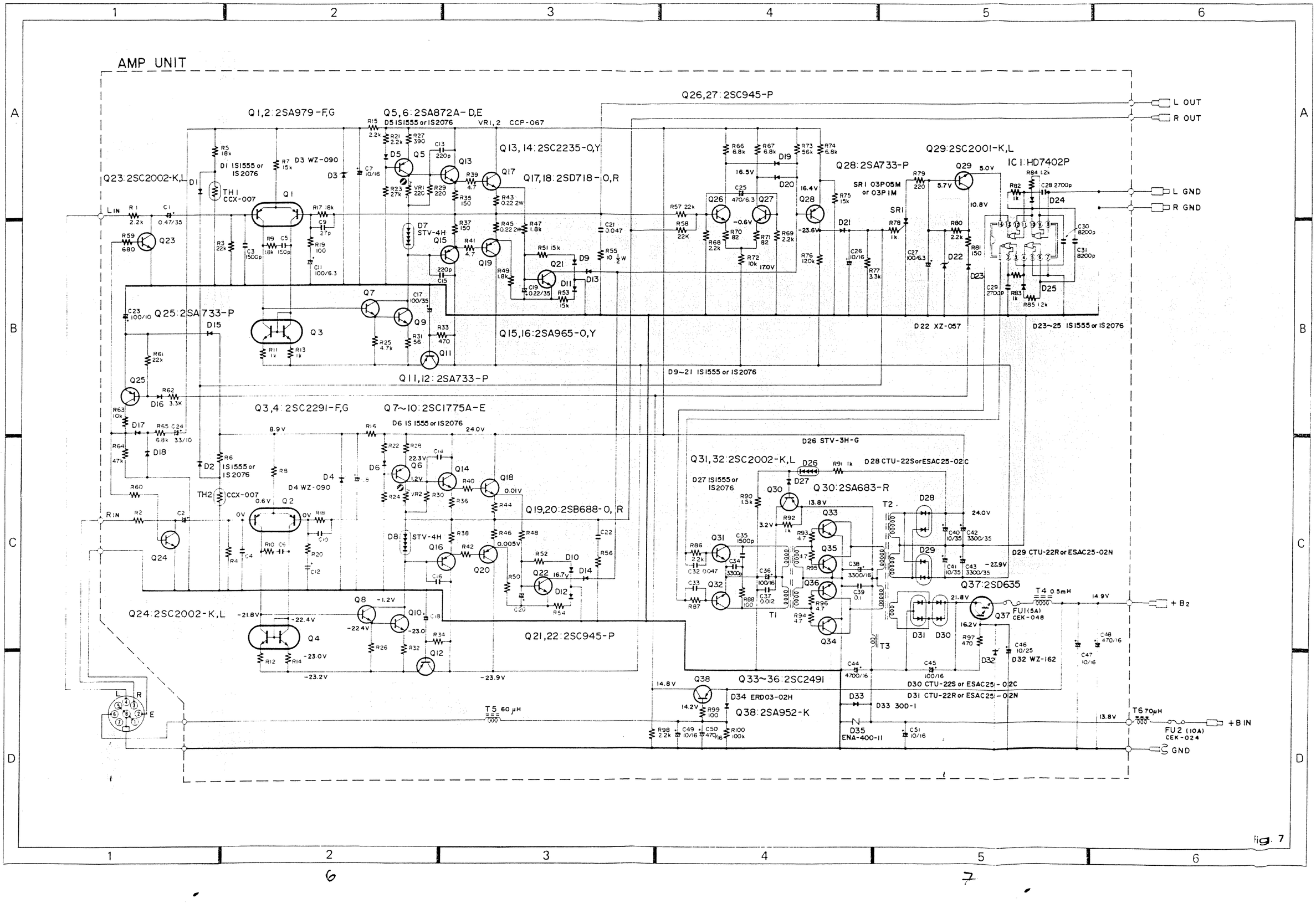
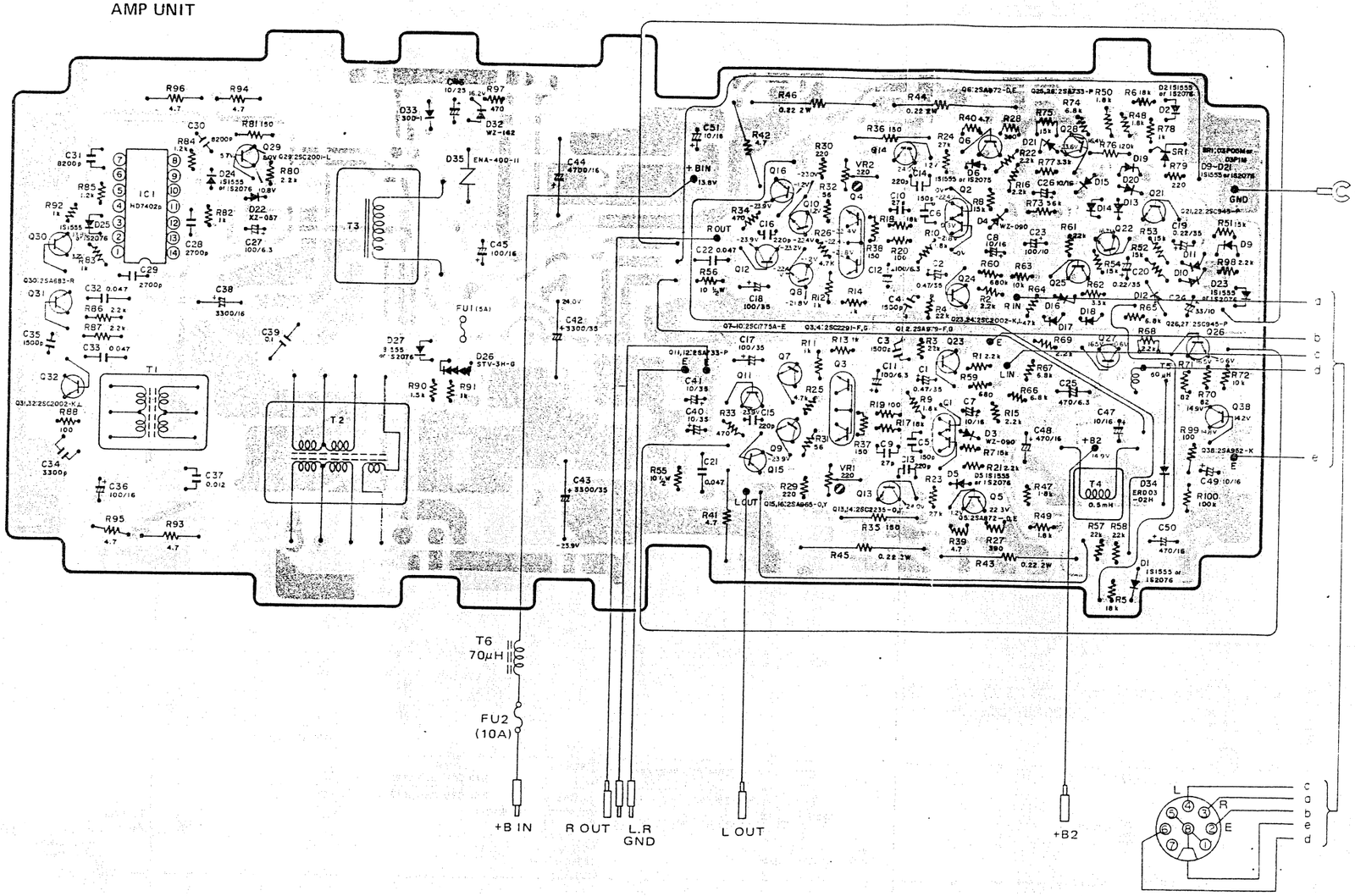


fig. 7

5. CONNECTION DIAGRAM

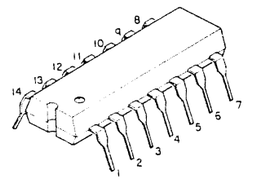
GM-120

AMP UNIT

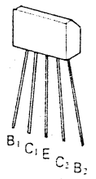


2SC1775A
2SA872A
2SA733
2SC945

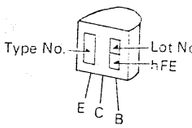
HD7402P



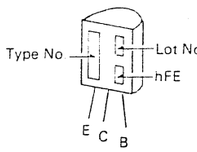
2SA979



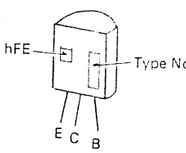
2SA952
2SC2001
2SC2002



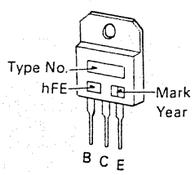
2SA965
2SC2235



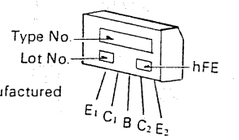
2SA683



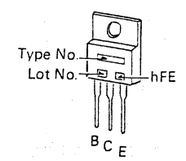
2SB688
2SD718



2SC2291



2SC2491



2SD635

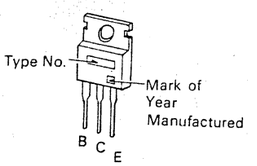


Fig. 8

6. EXPLODED VIEW

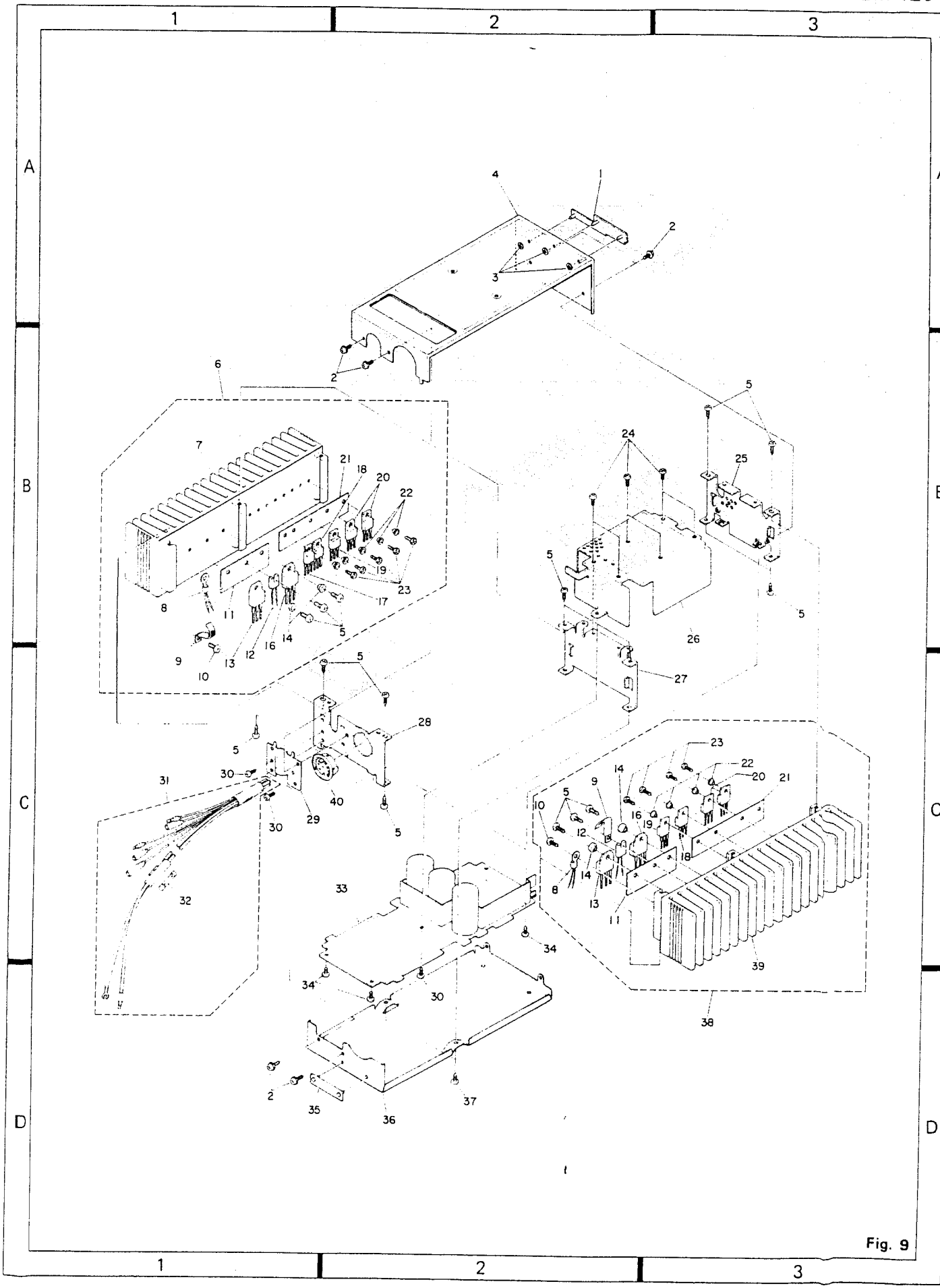


Fig. 9

7. PACKING METHOD

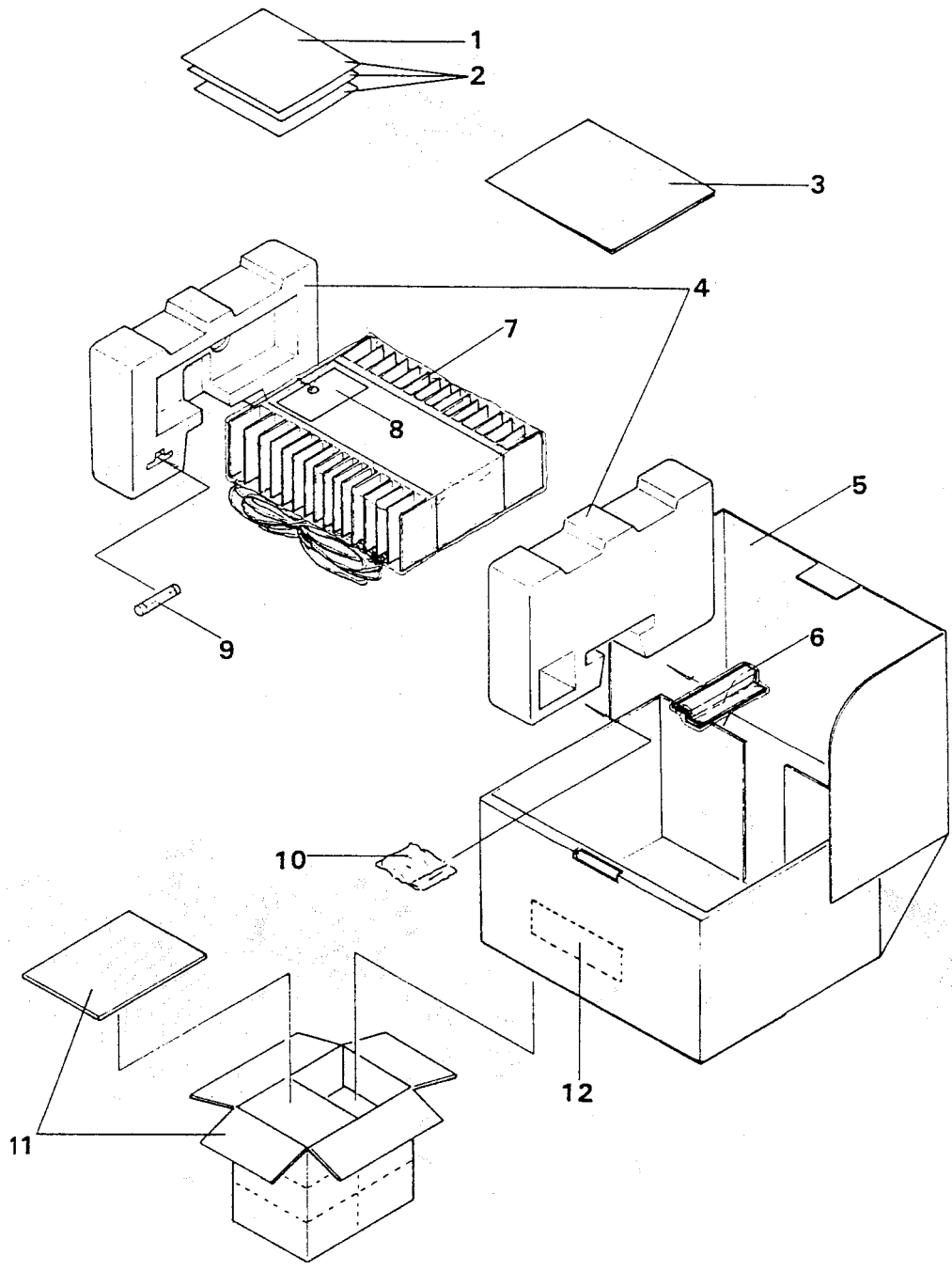


Fig. 10

8. PARTS LIST

NOTE:
When ordering resistors, first convert resistance values into code form as shown in the following examples.

Ex. 1 When there are 2 effective digits (any digit apart from 0), such as 560 ohm and 47k ohm (tolerance is shown by J = 5%, and K = 10%).

560Ω	*56×10¹*	*561*	*RD1/4PS 5 6 1 J*
47kΩ	*47×10³*	*473*	*RD1/4PS 4 7 3 J*
0.5Ω	*0R5*		*RN2H 0 R 5 K*
1Ω	*010*		*RS1P 0 1 0 K*

Ex. 2 When there are 3 effective digits (such as in high precision metal film resistors).

5.62kΩ	*562×10¹*		*RN1/4SR 5 6 2 1 F*

● Amp Unit

MISCELLANEOUS

NOTICE: As for Q1 and Q2, Q3 and Q4, Q5 and Q6, Q13 through Q16, Q23, Q24, Q31 and Q32, use the same rank on both channels respectively.

Part No.	Symbol & Description	
HD7402P	IC1	
2SA979-F, G	Q1, Q2	
2SC2291-F, G	Q3, Q4	
2SA872A-D, E	Q5, Q6	
2SC1775A	Q7 – Q10	
2SA733	Q11, Q12, Q25, Q28	
2SC2235-O, Y	Q13, Q14	
2SA965-O, Y	Q15, Q16	
VACANT	Q17 – Q20, Q33 – Q37	
2SC945	Q21, Q22, Q26, Q27	
2SC2002-K, L	Q23, Q24, Q31, Q32	
2SC2001	Q29	
2SA683-R	Q30	
2SA952	Q38	
1S1555 or	D1, D2, D5, D6, D9 – D21	
1S2076	D23 – D25, D27	
WZ-090	D3, D4	
VACANT	D7, D8, D28 – D31	
XZ-057	D22	
STV3H-G	D26	
WZ-162	D32	
30D-1	D33	
ERD03-02H	D34	
ENA-400-11	D35	Gapless Arrester
03P05M or	SR1	Thyristor
03P1M		
CCP-067	VR1, VR2	Volume, 220Ω
CTH-061	T1	Transformer
CTH-062	T2	Transformer
CTF-103	T3	Coil, 30μH
CTH-018	T4	Coil, 0.55mH
CTF-104	T5	Coil, 60μH
CEK-048	FU1	Fuse, 5A

RESISTORS

Part No.	Symbol & Description
RD1/4VS□□□J	R1 – R34, R37 – R40, R47 – R54, R57 – R88, R90 – R100
RD1/4PS□□□J	R35, R36, R41, R42
RD1/2PS□□□J	R55, R56
RN2P□□□K	R43 – R46
VACANT	R89

CAPACITORS

Part No.	Symbol & Description	
CSZAR47M35	C1, C2	
CQMA152K50	C3, C4, C35	
CCDSL151K50	C5, C6	
CEA100M16L	C7, C8, C26	
CCDSL270K50	C9, C10	
CEA101M6R3L	C11, C12, C27	
CCDSL221K50	C13 – C16	
CEA101M35L	C17, C18	
CSZAR22M35	C19, C20	
CQMA473K50	C21, C22, C32, C33	
CEA101M10L	C23	
CEA330M10L	C24	
CEA471M6R3NP	C25	
CQMA272K50	C28, C29	
CQMA822K50	C30, C31	
CQMA332K50	C34	
CEA101M16L	C36, C45	
CQMA123K50	C37	
CCH-007	C38	3300μF 16V
CQMA104K50	C39	
CSZA100M35	C40, C41	
CCH-047	C42, C43	3300μF 35V
CCH-048	C44	4700μF 16V
CSZA100M25	C46	
CSZA100M16	C47, C49, C51	
CEA471M16L	C48, C50	

● Miscellaneous Parts List

NOTICE: As for Q17 and Q19, Q18 and Q20, use the same rank on the same channel respectively

Part No.	Symbol & Description	Parts No.	Symbol & Description	
2SD718-O, R	Q17, Q18	CTU-22S or ESAC25-02C	D28, D30	
2SB688-O, R	Q19, Q20			
2SC2491	Q33 – Q36	CTU-22R or ESAC25-02N	D29, D31	
2SD635	Q37			
STV4H	D7, D8	CCX-007	TH1, TH2	Posistor
		CEK-024	FU1	Fuse, 10A

● Exploded View

NOTICE: As for the No. 13 and 16, use the same rank for same channel.

Key No.	Part No.	Part Name	Key No.	Part No.	Part Name
1		Badge		ESAC25-02N	
2	B90-023-E	Screw, M3 × 6	20	2SC2491	Transistor
3	B90-107-E	Washer, M2.6ϕ	21	CNM-578	Insulator
4	CNB-519	Case	22	B21-679	Bush
5	B90-070-E	Screw, M3 × 10	23	B90-108-E	Bolt, M2.6 × 8
6		Heat Sink Unit	24	B10-863-E	BM3 × 6
7		Heat Sink	25		Frame
8	CCX-007	Posistor	26		Shield
9		Lead Retainer	27		Frame
10	B90-049-E	Screw, M3 × 8	28		Frame
11	CNM-577	Insulator	29		Cramper
12	STV4H	Diode	30	B10-863-A	BM3 × 6
13	2SD718-O, R	Transistor	31	CDE-579	Cord
14	CNW-039	Bush	32	CEK-024	Fuse, 10A
15	.....	VACANT	33		Amp Unit
16	2SB688-O, R	Transistor	34	B90-083-A	Screw, M3 × 6
17	2SD635	Transistor	35		Plate (GM-120/U, C)
18	CTU-22S or ESAC25-02C	Diode	36	CNB-520	Case
19	CTU-22R or	Diode	37	B90-111-E	Screw, M3 × 10
			38		Heat Sink Unit
			39		Heat Sink
			40	CKP-027	Socket

● Packing Method

NOTICE: Parts whose parts numbers are omitted are subject to being not supplied.

Key No.	Part No.	Part Name	
1		Card	(GM-120/C)
2		Card	(GM-120/U)
3	CRB-340	Owner's Manual	(GM-120/U)
	CRD-078	Owner's Manual	(GM-120/C, E)
	CRD-079	Owner's Manual	(GM-120/E)
4	CHB-548	Styrofoam	(1 set pair)
5	CHB-547	Carton	(GM-120/U, C)
	CHB-610	Carton	(GM-120/E)
6		Mounting Bracket	
7	E36-609	Polyethylene Bag	
8		Tag	
9	CEK-024	Fuse, 10A	
10	CEA-225	Screw Kit	
11	CHB-546	Contain Box	(GM-120/U)
12	CAN-295	Seal (These seals are applied only to the Model GM-120/C.)	